DIVISION 15 – MECHANICAL

SECTION 15500

PIPING

PART 1 – GENERAL

1.1 SUMMARY

A. This section is intended to define the required quality standards of the materials furnished and the workmanship performed in connection with the herein specified items of piping and all the required accessories and appurtenances including, in part, all labor, tools, materials and equipment for the complete piping work for this contract which are not defined elsewhere in the specifications or on the drawings. All sanitary sewer piping shall conform to the requirements of the Loudoun County Sanitation Authority including the 4-inch sewer lateral connecting to LCSA manhole "F".

B. In shipping, delivering, storing and installing, pipe and accessories shall be kept in a sound, undamaged condition.

C. All pipe between structures and terminus shall be of the same size and material and shall be furnished by the same manufacturer. Each pipe length and all fittings shall be clearly marked at intervals of five feet or less with the manufacturer's name or trademark and pipe type or strength.

D. Piping Within Structures - Piping systems installed within structures shall be installed essentially where and as shown on the drawings, with ample clearances and allowances for expansion or contraction; installed with provision for the weight of the pipe and contents; shall be supported at proper intervals to assure uniform alignment and all other conditions encountered; including, provisions for support connections to the structural members. These support connections are to be so applied as to relieve all structural members of undue stress or strain.

E. It is the intent of this specification that all piping be installed "gas" and "water" tight. Any and all joints otherwise shall be repaired and faulty materials shall be removed from the project site. Test pressures shall be applied by the use of a hand-operated force pump or other suitable device. Pressure shall be maintained for such a time as required to permit the Engineer to complete the inspection of all pipe under test and mark the location of defective joints or other items for further correction. Testing shall be as specified in this section.

F. The Contractor shall be responsible for the location and size of any and all sleeves or openings required for the piping systems. He shall arrange for all chases, recesses, inserts or anchors, at proper times and at the proper elevation and location in the

structure construction. The failure to provide this information shall require that he pay for any and all costs incurred for these corrections. He shall arrange his work with all others engaged on the project, to maintain the proper relationship of this work with the work of all others.

G. Piping shall be laid to the elevation shown on the plans. Piping without specific elevations that conflict with other piping that has specific elevations shown on the plans shall be varied in depth; or necessary fittings shall be used to avoid the piping with specific elevations shown on the drawings.

PART 2 - PRODUCTS

2.1 POLYVINYL CHLORIDE PIPE AND FITTINGS (PVC)

A. General - Non-plasticized polyvinyl chloride compounds forming pipe and fittings of the normal impact, high tensile strength type, shall be used and shall be extruded to rigid "bone hard" dense uniform sections with smooth internal waterways that are abrasion resistant and they shall be compounded with properties to be unaffected by most acids and alkalis with resistance to age, weather or fire and shall have low thermal heat transference. Pipes shall be fabricated in 20 foot length and in iron pipe sizes for usage as follows.

B. PVC Schedule 40 Pipe - Schedule 40 pipe shall be used for the Bioxide chemical line encasement pipe.

C. PVC Schedule 80 Pipe - Schedule 80 pipe shall be used where threaded fittings and valves are fabricated into the completed piping system. Flange fittings or valves where shown or required shall have companion flanges of the threaded type on the pipe side of these connections.

D. PVC Fittings - Fittings used with PVC pipe shall have all the physical properties and characteristics of the pipe specified above. Each fitting shall be extruded to the high uniform quality and strength and to the proper size required in the fabricated systems.

E. PVC Recessed Socket Type Fittings - Recessed socket type fittings shall be of the long radius patterns and shall have wall thicknesses and strength equal to those of Schedule 40 pipe. Sockets shall have a deep uniform cylindrical bore so that the OD of the pipe engages the socket and the fittings with proper clearance for chemical welding.

F. PVC Threaded Fittings - Threaded fittings shall be of the long radius patterns and shall be of equal wall thickness and strength as for Schedule 80 pipe. Threads shall be recessed and cut to the threading standards of the ANSI B2.1.

G. PVC Flange Fittings - Flange fittings shall have wall thickness and strength equal to those of Schedule 80 pipe, and shall have faces scored for semi-rigid gaskets of not more than 1/8 inch thick material. Gasket material shall be the same as of the pipe and shall have reinforced shoulders under the bolt and nut heads. Bolts shall be square headed machine bolts with hexagon nuts and they shall be of corrosion resistant metal or of galvanized steel.

H. PVC Pipe Cutting - Pipe cuts must be straight and square with the pipe centerlines and shall be made only with a miter box. A fine tooth hand saw for wood having fourteen or more points per inch shall be used for cutting pipe. After cutting the internal pipe, ends shall be slightly reamed to remove all burrs.

I. PVC Pipe Threading - Standard tapered pipe threads shall be formed using harp dies with a negative rake angle of about 5 degrees. Threading of the pipe shall be done over an inserted tapered wooden plug to assure deep, uniform threads. Dies must be sharp and clean. Threaded joints shall be assembled using either a graphite base compound; "Teflon" tape, 8 mils thickness, 1/2 inch wide, as manufactured by Minnesota Mining and Manufacturing Company; or a compound recommended by the fitting manufacturer. Apply the compound to the male threads only and seat the joint at slightly more than hand tightness. Wrench marks will not be allowed on either the fitting or the pipe anywhere or any time in the work.

J. PVC Chemical Welding - Chemical welding (solvent welding) shall be done in strict accordance with the manufacturer's recommendations. In general, welding shall be made only after cleaning both the pipe and the fitting contact areas with the cleaner recommended. Apply cement lightly to both the pipe and the fitting and slide the fitting into the pipe with one continuous motion and at the proper time. Rotate the fitting lightly to distribute the cement and wipe off any excess cement with a clean rag. Cement for chemical welding shall be delivered to the job site in sealed pint containers and shall be kept covered at all times when not in use. Cement shall not be diluted or thinned or altered on the job. Cement shall be only that recommended by the pipe manufacturer.

PART 3 – EXECUTION

3.1 All buried or underground pipe shall be furnished in accordance with the same specification stated above, except that pipe thickness shall be designed on the basis of the depth of cover as indicated on the drawings. Care shall be exercised in laying the piping on the elevations shown on the drawings. Where specified elevations of piping are not shown on the plans, piping shall be placed with a minimum of three (3) feet of cover. Piping that does not have specific elevations, or that conflicts with other piping that does have specific elevations, shown on the drawings shall be varied in depth, or necessary fittings shall be used to avoid the piping with the specific elevations shown on the drawings at no added expense.

3.4 Equipment Pipe Connections - Care shall be taken in bolting flanged joints, so that there is no restraint on the opposite end of the pipe or the fitting which would prevent uniform gasket pressure at the connection or would cause unnecessary stresses in the equipment flange. Bolts shall be tightened gradually at a uniform rate and in a program that will result in uniform gasket compression over the entire area of the joint. Special care shall be taken when attaching suction and discharge piping to pumping equipment so that no stresses are transmitted to or imposed on the pump.

3.5 Lining Up Bell and Spigot Pipe - Pipe lines or runs intended to be straight shall be so laid. Deflections from a straight line or grade, made necessary by vertical curves or horizontal curves or offsets, shall not exceed 4/D inches per linear foot of pipe (where D represents the nominal internal diameter of the pipe expressed in inches) between the centerline, extended, of any two connecting pipes. If the specified or required alignment requires deflections in excess of those stipulated above, the Contractor shall provide either special bends as approved by the Engineer, or pipes in shorter lengths in such length and number that the annular deflections at any joint, as required by the specified maximum deflections, are not exceeded.

3.6 Laying Pipe in Trench - Each pipe length, having been properly cleaned and tested, shall be laid on the previously graded trench bottom after the bell hole has been dug; after proper joint cleaning, the joint gasket or rubber ring, if used, shall be placed on the pipe spigot as recommended by the manufacturer. The Contractor shall make written note of such factors as coverage, supports, and such additional pertinent data as will be required by future contractors for the replacement of any buried facility.

A. Only proper and suitable tools and appliances for the safe and convenient handling and laying of pipes and fittings shall be used. Pipe, fittings, and valves shall be carefully handled and lowered into the trench. Under no circumstances shall any pipe or fittings be dumped or rolled into trench or be allowed to drop against the pipe or fitting already in the trench. Great care shall be taken to prevent the pipe lining and coating from being damaged, and any lining or coating damaged in any way shall be repaired by the Contractor to the satisfaction of the Engineer. Defective, damaged or unsound pipe will be rejected.

B. The interior of the pipe shall be thoroughly cleaned of all foreign matter before being lowered into the trench and shall be kept clean during laying operations by means of plugs or other approved methods. The pipe shall not be laid in water or when the trench or weather conditions are unsuitable for such work. When work is not in progress, open ends of pipe and fittings shall be closed securely so that no trench water, earth, or other substances will enter the pipe or fittings.

3.7 The full length of each section of underground pipe shall rest solidly upon the pipe bed, and any defects due to settlement shall be made good by the Contractor at his own expense. The ends of pipe shall abut against each other in such manner that there shall be no shoulder or

unevenness on the inside of the main. Bell holes shall be dug sufficiently large to ensure the making of proper joints. Special pre- cautions shall be exercised to prevent any pipe from resting on rock.

3.8 Any pipe that has the grade or joint disturbed after laying shall be taken up and relaid. Any pipe, pipe fittings, or appurtenance found defective after installation shall be replaced without additional expense to the Owner.

3.9 Except where otherwise necessary in making connections or closures, or as authorized by the Engineer, bell-and-spigot pipe shall be laid with bells facing in the direction of laying.

3.10 Where pipe cutting is necessary, it shall be done in a neat and workmanlike manner without damage to the pipe. Unless otherwise authorized, cutting shall be done by means of an approved type of mechanical cutter which will leave a smooth end at right angles to the axis of the pipe and not otherwise damage the pipe or lining. Wheel cutters shall be used when practicable.

3.11 Excavation shall be kept free from water and no joint shall be made under water. The Contractor shall be careful during backfilling to prevent damage to or disturbing of joints and to protect the watertight integrity of the pipes at all times. There shall be no walking on or working over pipe until backfill is over pipe. Backfilling shall be commenced by depositing and tamping earth layers not more than 4 inches thick around and over the pipe to a point not less than 1 foot in depth over the top, after which backfilling of the remainder of the trench may proceed.

3.12 Sheeting and shoring shall be in accordance with construction methods established in the Associated General Contractors of America Safety Code. The Contractor shall follow this AGC Manual in determining whether or not sheeting and shoring is required and shall follow the AGC recommended procedure for installation.

3.13 Bedding for Flexible Pipe – All flexible pipe including PVC and HDPE pipe shall be installed with a stone envelope.

3.14 Piping shall not obstruct openings, passageways, hoist, and dismantling spaces. Piping connected to equipment shall be supported completely independent of the equipment. Pipe supports shall be installed as specified herein

3.15 Pipe testing including hydrostatic and leakage testing shall be in accordance with the requirements of the LCSA.

3.16 Gravity sanitary sewers shall be tested under low air pressure in accordance with the requirements of the LCSA.

END OF SECTION